

Superfund

Solutions

JPL's Environmental Cleanup Effort

Number 2

January 2000

Our thanks to all of our neighbors who attended the NASA/JPL Open House on June 5 and 6, 1999. We appreciated the opportunity to talk to those of

you who took the time to stop by the Superfund display to pick up information on the project.

GOOD NEIGHBORS

The Superfund project has reached another milestone as the Remedial Investigation (RI) Report for Operable Units 1 and 3: On-Site and Off-Site Groundwater was finalized this summer. The RI Report for Operable Unit 2: Potential On-Site Contaminant Source Areas was finalized this fall. This issue of *Superfund Solutions* will bring you up-to-date on some other aspects of the Superfund program. As always, we hope you will continue to feel free to contact us with any questions or concerns.

As required by Superfund environmental cleanup regulations, JPL has been investigating the soil and groundwater both on- and off-site at the National Aeronautics and Space Administration's installation for several years now.

SUPERFUND Status Report

The work, called a Remedial Investigation (RI), has progressed well and is now final. All data on the nature and extent of contamination, plus the movement of those contaminants, was analyzed. The next step will be to use that information to evaluate where cleanup is appropriate to protect human health and to study the sensibility of different cleanup treatment methods. Once a remedial approach is selected, cleanup will begin.

WORKING WITH OUR GOOD NEIGH- BORS TO DISCOVER SOLUTIONS TO MUTUAL PROBLEMS

During the RI, the water from more than two dozen monitoring wells both on the Laboratory's site and in surrounding areas were sampled and analyzed for more than 100 potential contaminants. The results of the analyses of groundwater are available in the information repositories. Soil vapor samples from wells throughout the site were also collected and analyzed. Although several chemicals are present in the groundwater, the treatment systems installed by the local water purveyors are adequate to ensure that water delivered to the public meets all safe drinking water requirements.

The Agency for Toxic Substance and Disease Registry (ATSDR), a federal agency within the U.S. Department of Health and Human Services, which makes independent public health assessments of Superfund sites, issued its final report on the JPL site this summer.

This report, now available at the Pasadena, Altadena, and La Canada Public Libraries, as well as at the JPL Repository, contained the following major conclusions:

- ♦ Off-site groundwater containing the volatile organic compounds or VOCs — carbon tetrachloride; trichloroethene (TCE), and 1,2-dichloroethane (1,2-DC4) — is not a past, present, or future hazard to public health because water purveyors (municipal water departments and private water companies) are required by the California Department of Health Services to regularly monitor their



drinking water wells, and to take steps to ensure that the water delivered to their customers is safe.

- ◆ On-site groundwater has not posed a hazard to JPL employees because that water has never been used as a source of drinking water.
- ◆ Perchlorate presents no apparent present or future public health hazards because water purveyors who have found it in their water supplies have mixed water from other sources to reduce its concentration to levels believed to be safe. The past presence of perchlorate is uncertain because there are no data on its presence or concentrations prior to 1997, either in on-site or off-site groundwater and, therefore, the past public health risk, if any, is indeterminate.
- ◆ No public health hazards are associated with the soils on or around JPL.
- ◆ VOC vapors were detected in relatively shallow soil near one particular building on the JPL facility, but at levels that do not present health hazards.

Now that the RI is complete, a feasibility study to identify and assess remedial options will be conducted. The findings from the feasibility study will be used to write a Proposed Plan for Remediation. After the remedial technology is determined in the proposed plan, public comment on any proposed remediation steps will be sought during a 30-day public comment period that will be held in the future. After regulatory agency and public comments have been addressed, the remedial selection will be finalized in a Record of Decision (ROD).

Local public meetings will be held in surrounding communities during this period, and JPL will attempt to notify all parties interested in the Laboratory's Superfund process. At these meetings, the public will be invited to ask questions about the process and to share their views on the proposed cleanup plan.

AT THIS POINT, WE HAVE INFORMATION SHEETS ON

HYDROLOGY

GROUNDWATER

GROUNDWATER
WELLS

SOIL

HAZARDOUS
CHEMICALS

For copies of other documents related to the Superfund cleanup, check these local public information repositories:

Altadena Public Library
600 E. Mariposa Ave.
Altadena

La Cañada-Flintridge Public Library
4545 Oakwood Ave.
La Cañada-Flintridge
Pasadena Central Library
280 E. Walnut St.
Pasadena

ENVIRONMENTAL CLEANUP FACT SHEETS

A series of fact sheets with the title, *Environmental Cleanup Review*, were mailed out to area residents to provide information related to the Superfund process. The first fact sheet gave a brief history of the environmental concerns that led up to JPL's selection as a Superfund site. Later fact sheets covered such topics as how the Superfund process works (No. 2); soil and ground-water testing done on the JPL site (No. 3); and the three principal operational units of the ongoing remedial investigation/feasibility study at JPL (No. 4). If you missed one of these fact sheets or would like more copies, please contact the JPL Public Services Office (see back page) or visit any specially designated public information repository.

The chemical formula for perchlorate is ClO_4^- . This compound consists of one chlorine (Cl) atom attached to four oxygen (O) atoms, but missing one electron in its outer shell, which is the reason for the minus sign (-) in the formula. When added to

The ABC's of ClO_4^- ammonium, potassium, or sodium atoms, it becomes a salt and is a very useful compound in rockets, fireworks, and certain medical applications. Ammonium perchlorate is a key oxidizer in the space shuttle's big solid rockets as well as other smaller, expendable solid rockets. Until recently, potassium perchlorate was used to treat humans with hyperactive thyroids that resulted from the autoimmune condition known as Graves' Disease.

The molecule breaks down in water; however, with the ammonium, potassium, or sodium separating from the perchlorate, the perchlorate can remain in aquifers or surface waters for some time, because it doesn't bond readily to other elements or compounds once in water.

Negative health effects — if any — of drinking water with perchlorate are not known at this time, because the chemical has only recently been found in some water supplies. As a precaution, however, the Department of Health Services has set a limit of 18 parts per billion for safe consumption.

For more information on this subject, see the U.S. Environmental Protection Agency's web page at <http://www.epa.gov/ogwdw/ccl/perchlor/perchlo.html>.

SOLUTIONS

GETTING THE PERCHLORATE OUT

People may think that the water they drink, whether from a kitchen tap or a plastic bottle, is pure, simple H_2O — but it seldom is. Almost all water supplies contain varying amounts of salts, acids, solid particles (like sand) and other compounds that get into the water either from natural sources or from human activities.

Public health agencies and water purveyors — municipal departments or private companies — constantly monitor the water people drink, looking for these compounds. Depending on which ones they find, and at what concentrations, these providers declare the water either safe or unsafe to drink.

A key part of that process is testing. Federal and state agencies are constantly on the alert for new, or more sensitive tests with which they can judge water safety. One new test has enabled purveyors to detect the presence of perchlorate, a chemical used in rocket fuel, fertilizer, and fireworks, in the groundwater at several places in the San Gabriel Valley.

Perchlorate is considered a potential environmental health risk. The State of California has established an allowable concentration of 18 parts per billion of perchlorate (18 ppb) in potable water, as an interim standard. Also, the State has indicated that this interim standard will remain in effect while studies are carried out that will enable the State to issue a final permissible concentration level in potable water.

JPL has been a leader in the effort to find a reliable, efficient means of removing perchlorate from groundwater and began a series of small-scale experiments in late 1997. The Laboratory has investigated several approaches:

◆ **Ion Exchange.** Because the perchlorate molecule has a negative electrical charge, it will be attracted to a substance with a positive charge. JPL contracted with industry engineers to find an "anion exchange resin," a positive-charged compound with a texture similar to fine sand, and passed water containing perchlorate over it. The perchlorate attached itself to the resin and its concentration in the water dropped to nondetectable levels.

◆ **Reverse Osmosis.** Osmosis is a process by which a semipermeable membrane establishes an equilibrium, or balance, between a salty solution on one side and a saltier solution on the other. Reverse osmosis uses pressure on the saltier side of the membrane to drive the water through to the less salty side, leaving the solute — in this case, the perchlorate — on the saltier side. The non-salty side is safe for drinking.

◆ **Biological Reduction.** In this approach, a particular strain of bacteria was added to the perchlorate-laden water in a special reaction chamber, and they devoured it.

Each of the above-described techniques has plus and minus aspects. Perchlorate builds up on the resin in the ion exchange method, requiring periodic flushing and destruction of the chemical (although a very efficient way of doing this has been devised). Reverse osmosis, like ion exchange, also accumulates perchlorate, which must be further treated and disposed of. The biological method must be disinfected to kill the bacteria, after the bacteria have consumed the chemical, but even then California water regulations preclude the direct consumption of bio-treated water.

Presently, ion-exchange or reverse osmosis appears to be the optimal way of removing perchlorate from groundwater and JPL is looking into various ways of dealing with the residue (called the “rejectate”).

ADDITIONAL INFORMATION

For information on the environmental cleanup effort at JPL, and for ideas on how you can become involved, please contact:

Public Services Office
Jet Propulsion Laboratory,
Bldg. 186-113
4800 Oak Grove Drive
Pasadena, California
91109-8099
Tel: (818) 354-0112

The following local contacts represent agencies involved in the Superfund process:

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